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NEW CHEMICAL ELEMENTS

G. S. Vozdvizhenskiy S.:M.: Kirov Instict Chem Tech,: Kazan

It always seemed that there could and should be other chemical elements beyond uranium, the so-called transuranium elements, the discovery and study of which would be of no small theoretical and practical interest, if only because they all would obviously be radioactive. Thus, chemists' efforts were directed to finding new chemical elements to fill out the periodic table for the numbers 93, 94, 95, 96, etc.

No less obvious was the possibility of developing the periodic table preceding the first element -- hydrogen.

Let us consider the prehydrogens. This term has not yet become current in scientific literature, although it is no less fitting, accurate, and necessary than the term "transuraniums". Its introduction points the way toward significant paths of progress, the undoubted development of the periodic system in another direction, beyond hydrogen.

The present-day notion of a chemical element must be expanded considerably by the introduction of at least some of the elementary particles, on terms of equality with them, out of which the atoms of chemical elements are built. In fact, the qualitative difference between the various chemical elements of increasing complexity from hydrogen to curium is based upon changes in the quantitative composition of the elementary particles that go to make them. The simplest element (up to the present time), hydrogen, consists merely of a proton (plus neutrons in the case of its heavy isotopes) and an electron. But quantitative change may extend still further, and the different elementary particles (say, neutrons and electrons) may constitute even simpler chemical elements than hydrogen.

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Modern theory foresees the possibility of forming atomic systems of a new type out of the elementary particles (1). For instance, positronium is formed from an electron and a positron. The para-positronium atom, with dimensions of the order of the hydrogen atom, is found to be unstable, as the electron and the positron may be converted into two photons in a mean interval of time of the order of 10⁻¹⁰ sec. Ortho-positronium is transformed with the emission of three photons, and its life is about 100 times as long. Likewise, it is possible to have molecules of two atoms of positronium as well as analogous systems consisting of a mesotron and an electron (mesotronium) or with two mesotrons (bi-mesotron). All of these systems will disintegrate after definite intervals of time. Their lives are at the limit of present-day methods of observation, and we must now expect the rapid discovery of similar metastable systems. Apparently, a whole new chapter in atomic chemistry will soon arise, devoted to these metastable ultralight isotopes, which will evidently be the first transhydrogens.

The first scientist bold enough to include the neutron in the periodic system and to identify it with the element "U" of D. I. Mendeleyev (placed in the zero group ahead of hydrogen) was Prof A. M. Vasil'yev of the Kazan Institute of Chemical Technology (2).

This outstanding discovery has not been really evaluated up to the present time. This true evaluation, it seems to me, should be confirmed by giving a new name to the neutron as an element of the periodic system. It should suggest that it be named "mendelevium" in honor of D. I. Mendeleyev. Some 12 years after A. M. Vasilyev's discovery a paper was published dealing with the problem of including the elementary particles in the periodic system and assigning them definite places therein. This was the paper of E. I. Akhumov (3).

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